ENERGY ISSUES IN THE CALIFORNIA-BAJA CALIFORNIA BINATIONAL REGION

DRAFT

Prepared by the Border Energy Strategy Committee

The Border Energy Strategy Committee is a joint project of:

San Diego Associaton of Governments
San Diego State University
Southwest Center for Environmental Research and Policy
San Diego Regional Energy Office
Univeresidad Autónoma de Baja California

This report will be considered for action by the San Diego Associaton of Governments as part of the Regional Energy Strategy a nd will be part of the public review and comment process for the Regional Energy Strategy.

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Border Energy Strategy Committee

The Border Energy Strategy Committee (BESC) was established to develop strategies and recommendations related to the growing integration of the energy sectors of California and Baja California, Mexico. This report is especially directed towards local elected officials and other decision makers concerned about energy related issues in the binational region.

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I. Introduction: Vision and Purpose of Report

It is our **vision** that the quality of life for residents in the California-Baja California binational region will be greatly improved by the development of safe, reliable, affordable and clean sources of energy.

One way to achieve this vision is to better understand the dynamics and realities of cross border energy markets as they exist in the border region consisting of San Diego and Imperial Counties and northern Baja California. Energy is an indispensable lifeblood's of the region. It makes homes and businesses comfortable, moves people and goods, operates the machinery of industry and powers the infrastructure that underpins the region's communities. This pervasive role makes energy a key issue in the binational region's future. Energy choices made today will have significant effects on tomorrow's economy, environment and quality of life.

During the past few years the energy sectors of California and Baja California have grown increasingly integrated and a significant cross border market for energy services has developed. At the current time, there are more power plants, transmission lines and natural gas projects planned and under construction in Baja California than in San Diego and Imperial Counties. A large portion of these projects are designed to meet current and projected energy demand in California, as well as the needs of Baja California residents and businesses. The significance of growth in energy demand in Baja California and the extensive energy projects under way on the Mexican side of the border has gone largely unnoticed by many decision makers and stakeholders on the U.S. side of the border.

The emergence of a vital energy market in this portion of the U.S.-Mexican border region offers a great many opportunities and benefits, while at the same time raises many challengers. Economic benefits to Baja California will result from the sizeable investments in large infrastructure projects, the whole region will gain from reliable and modern power plants burning relatively clean natural gas, and new opportunities will arise for the creation of a new energy services and energy manufacturing sector serving the needs of both California and Baja California.

Alongside the benefits of extensive cross border energy markets, also come problems that need to be addressed. Mexico must not become a "pollution haven" where power plants are sited because of real or perceived lower environmental standards than exist in California. The physical environment knows no political boundary, and air and water pollution generated on one side of the border directly effects residents on the other side. For better or worse, San Diego and

Tijuana, and Imperial County and Mexicali share the same air and water resources and in many cases must deal with each other's waste products.

Another area of concern is the reliability of natural gas supplies to Mexico. If San Diego and California come to rely heavily on power from Mexico, and most of that power is fueled by natural gas, then a secure gas supply to Mexico is critical to assure a secure power supply to California. Similarly, as Baja California becomes more dependent on natural gas from the U.S., it needs to have adequate assurances regarding the reliability of that supply.

A synergistic, interdependent energy market is developing in the border region, but the related financing, regulatory, administrative and policy structures are not in place to adequately exploit the benefits of this new reality, or to deal with the challengers it creates. The purpose of this report is to layout the issues associated with this new binational energy market in the California – Baja California region so these new opportunities and challengers can be better understood and adequately met. The geographic focus here is on Baja California and Imperial County as there is a separate study underway examining the energy infrastructure of San Diego, the Regional Energy Infrastructure Study (REIS). The results of this effort will be integrated with the REIS so a comprehensive analysis of the full binational region is available. The recommendations presented in this report apply, however, to the whole binational region.

Although individuals from Mexico participated in this study, most of the participants and funding were from the U.S. side of the border. The suggestions and recommendations are, to a large degree, a reflection more of a California view of the issues than of a true binational perspective. We hope this report will begin a process that will lead to greater involvement and participation from individuals and agencies from Mexico so that a truly binational consensus can be developed.

II. Energy Infrastructure in the California-Baja California Binational Region

The California-Baja California Binational Region consists of the 60-mile (100 km) wide zone north and south of the U.S.-Mexican international boundary. It encompasses all of San Diego and Imperial Counties on the U.S. side of the border and the *municipios* of Tijuana, Rosarito, Ensenada, Tecate, Mexicali and San Felipe on the Mexican side. The current population of this region is 5.5 million. By the year 2020, the population is expected to almost double, to 9.4 million. By that time, more people will be living on the Baja California side of the border than on the California side, for the first time ever. In the San Diego-Tijuana region alone the population is expected to reach 7.6 million in the next 18 years, and the number of people just *added* to the region by 2020 will be equal to the total population that existed in 1990. Tijuana

alone is expected to add an additional 2.5 million residents in the next 18 years, *twice* as many people as live there now.

This relentless population growth is the principal factor driving increased demand for energy services in the region, especially in Baja California. Industrial growth in Tijuana and Mexicali requires more power and natural gas and the increasing numbers of cars, trucks and buses strains supplies of liquid fuels. From 1988 to 2001, peak power demand and energy consumption grew at an average annual rate of 11.3% and 12.3%, respectively. These are very large annual growth rates, far surpassing those in San Diego or California. Demand for power in Baja California is expected to remain high over the next ten years, growing by 6% to 7% per year, according to the Mexican Federal Electricity Commission (CFE).

This increased demand for energy in Baja California is taking place alongside currently existing high demand in California and San Diego, which will also grow in the future. Currently, the demand for electricity in San Diego County is more than twice that of Baja California.

The demand for power in San Diego and Baja California can be met in four ways: by generating more power in the region, by increasing imports from outside the region, by reducing demand through energy efficiency and conservation, or by some combination of all of these. For Baja California, generating more power locally would require a *doubling* of the installed capacity in Baja California from its current 2,115 megawatts to 4,230 megawatts. Baja California can import limited amounts of power only from southern California or Arizona, because its power grid is not connected to the Mexican national system. In addition, there are constraints on the amount of transmission capacity into both San Diego and Baja California. Conservation and efficiency should be aggressively pursued in Mexico, and many such programs are in fact in place and under development. However, when developing countries move rapidly along the path to greater industrialization, a goal most Mexicans desire, energy use increases rapidly, only slightly moderated by conservation.

Alongside the need for more power in Baja California and San Diego, there is also a growing demand for natural gas, both as a fuel for power plants and for industrial and residential purposes. Of the fossil fuels, natural gas is a fuel of choice because its environmental effect is less than alternatives such as oil, liquid propane gas (LPG) or coal. Mexico's Energy Regulatory Commission (CRE), projects a 53% increase in natural gas demand for Mexico by 2008, with much of the increase going to increased power production fueled by natural gas . Because of Baja California's geographical isolation from the mainland, its power grid is not connected to the Mexican national system nor does it receive natural gas originating in Mexico. All of Baja

California's electricity is generated locally and its relatively recent natural gas supplies come from the United States and are transported to Mexico via cross border pipelines near Tijuana and Mexicali.

Baja California's current generating capacity is 2,115 megawatts (MW). The state relies principally on two large power plants. A complex of units at Rosarito, 15 miles south of the border, fueled by a combination of diesel, fuel oil and natural gas for an installed capacity of 1,330 MW, and four geothermal steam generators near Mexicali at Cerro Prieto with a total output of 720 MW. In addition there is a 55 MW diesel generator in Ensenada.

In the last few years, a significant number of new power plants have been proposed in Baja California and in California within the binational area. Some are already under construction and others are sill in the planning phase. 3,500 MW of new capacity have been proposed, as shown in Table I. In addition to new power plants planned and under construction, new and upgraded cross-border transmission lines are also being planned and are under construction.

Table 1
Planned Generation Additions in the California-Baja California Binational Region

Company - Project	Nominal Capacity (MW)	Interconnection Points	Planned In-Service Date
SER – TDM Mexicali	600	Imperial Valley Substation	June 2003
InterGen Mexicali, BC	750	La Rosita Substation (590 MW nominal) & Imperial Valley Substation (160 MW nominal)	March 2003
InterGen Phase I Mexicali, BC	160	Imperial Valley Substation	July 2002
InterGen Phase II Mexicali, BC	150	Imperial Valley Substation	June 2003
AES – Rosarito Rosarito, BC	550	Presidente Juarez Substation	Summer 2003
CFE current RFP San Luis Rio Colorado, Sonora	250	Mexicali II San Luis Rio Colorado	June 2005
CALPINE - Otay Mesa, CA	550	Otay Mesa Switchyard	June 2003
AEP – Phase I California	250	Miguel or Otay Mesa Switchyard	Summer 2004
AEP – Phase II California	250	Miguel or Otay Mesa Switchyard	Summer 2005
Total	3510		

SER – Sempra Energy Resources: TDM – Thermoeléctrica de Mexicali: AEP – American Electric Power: AES – American Electric Service Company: InterGen – Jointly owned by Shell Generating and Bechtel Enterprises Energy: BC – Baja California: CALPINE – California Energy Co. based in San Jose, CA.

Until just a few years ago, natural gas was not available in Baja California. Although Mexico has abundant supplies and reserves of natural gas, no pipelines extend to Baja California. The first gas pipeline into Baja California from California was completed in 1997 by Sempra Energy, and crosses the border east of Mexicali. It is being used to supply residential and industrial customers in that area and is expected to supply service to 25,000 customers by the end of 2002. A second

line, also built by Sempra, has been completed from San Diego to Tijuana, and will be used to supply the power plant complex at Rosarito with natural gas. An even more ambitious gas pipeline project, the North Baja Pipeline Project, is being developed by Sempra, PG&E Corporation's National Energy Group and Próxima Gas.

A series of proposals recently have been put forward to construct a large regassification facility for liquefied natural gas (LNG) somewhere on the Baja California coast between Tijuana and Ensenada. At least four proposals have been put forward by Marathon Oil, El Paso Corporation and Phillips Petroleum Co., Sempra Energy and CMS Energy, and Royal/Dutch Shell. If any one of these proposals comes to fruition, Baja California will have the only regassification facility on the west coast of North America.

If the announced power plants are completed within the next five years, installed capacity in Baja California would more than double, to approximately 4,575 MW. By comparison, installed capacity in San Diego today is only 2,300 MW and would go up by approximately 50%.

III. Opportunities and Challenges of Binational Energy Markets in the California-Baja California Region

The emergence of a vital energy market in the binational area provides benefits to the region and opportunities to improve the quality of life for residents. At the same time decision makers, elected officials, investors and stakeholders will be confronted with significant challenges.

The benefits and opportunities fall into three areas: added supplies of electricity and natural gas; new investment in the region, especially Mexico; and the possibility of developing new companies focusing on providing energy services, developing new technologies and expanding the use of clean energy systems.

Opportunities

New Energy Supplies

If all the announced power plants and natural gas projects are completed on schedule, there will be an additional 2,400 MW of installed capacity and 1.5 billion cubic feet per day (Bcfd) of natural gas in Baja California by 2006. Since the expansion of Cerro Prieto and upgrades to the Rosarito power complex are all but complete and construction is well advanced on two Mexicali power plant complexes, installed capacity in Baja California will be more than double current capacity, within the next 3-5 years. Approximately 1,700 MW is currently planned for export to California with 1,160 MW from the two merchant plants near Mexicali using their own independent

transmission lines. It should be kept in mind these plants will sell power to the highest bidder, and that may not necessarily be in California. Exports to California from Mexican owned plants over CFE power lines are limited to about 800 MW, because of transmission capacity constraints.

Near term new natural gas supplies are much less certain. The North Baja pipeline proposed by Sempra is slated to deliver 500 million cubic feet per day (MMcfd) by the end of 2002. It is highly likely this pipeline will be completed because it is needed to supply fuel to new power plants near Mexicali. The LNG projects discussed above have significant governmental support but are much more problematic and could run into significant cost issues and local opposition. For that reason, we believe that only about 500 MMcfd of new gas supplies will be available in Baja California by 2003; however, the pipeline capacity could probably be expanded with additional compression to deliver 800-1,000 MMcfd. The gas from this pipeline will be for use in both Mexico and the U.S.

The additional supplies of electricity and natural gas from Baja California will help stabilize energy supplies to the binational region as well as increase the vitality of the growing transborder energy markets.

New Investment in Region

The new energy infrastructure planned and under construction in Baja California will bring significant amounts of on capital into the state. Modern, gas fired, combined cycle power plants cost approximately $600 per MW. The 2,460 MW of proposed new capacity in Baja California and nearby Sonora, represent an investment of approximately $1.58 billion. The cost of the natural gas pipeline is estimated at $250 million and the cost of an LNG facility is estimated at $500 million. Even without any investment in LNG facilities, energy related investments in Baja California will be approximately $1.7 billion. To put this into perspective, the gross regional product for Baja California was $15.3 billion in 1999. Thus, planned energy infrastructure investments represent 11% of Baja California's gross regional product, a significant amount.

Although not all this investment will take place directly in Baja California – much will be used for engineering, design and equipment purchases outside of Mexico – those funds invested in Mexico will create jobs, contribute to local, state and federal taxes and to economic development in the region. Once in operation, the power plants and natural gas facilities will provide employment for Mexican workers and contribute to the tax base of local communities.

New Industries

A vigorous binational energy market will give rise to new companies providing products and services to meet the needs of this new market. Expertise will be needed in binational project

development, financing mechanisms, familiarity with Mexican, U.S. and California energy related statutes, land use issues on both sides of the border and environmental issues and regulations in the binational region. Financial institutions, law firms, energy service companies and environmental assessment firms will benefit from a greater need for their services.

Companies specializing in air pollution reduction services and equipment will also find new opportunities in the binational energy market. Products and services will need to be tailored to the Mexican market, with emphasis on the special conditions of the border zone. Air pollution offsets, including mobile offsets in Mexico, is a new field to explore which could give rise to new methods to reduce air pollution in Mexico. Energy efficient devices and services, again tailored to the border realities, are other sectors that are underdeveloped in the binational region.

As natural gas supply becomes more broadly available in Baja California, companies will enter the market to convert many of the processes now served by electricity, propane or biomass (wood) to natural gas. They will offer new appliances, industrial process equipment and heating products. There is a good chance that these businesses will be predominately Mexican owned and have some form of arrangement with an American, Japanese or European manufacturers of equipment. During the retrofit process, the contractors will try to sell insulation, thermostats, weather stripping and related items. These items can and probably will be installed by Mexicans.

Financing of retrofits will be another key industry. Few people on either side of the border want to put money into energy saving devices. Energy devices have to be sold based on their leading to higher productivity, more comfort, or greater return on investment. But even then, most companies have a higher "hurdle rate" when it comes to energy investments. That means that the return on investment has to be higher for energy investments than they expect for product related investments. Therefore there is a need for financing or third party ownership of the equipment.

Challenges

The main challenges arising from large scale energy facilities in Baja California are their effects on the natural environment of the binational region and the health effects for residents within the region. The two most important elements of the natural environment effected by energy facilities are air quality and water quality and quantity.

Air Quality

All combustion type power plants emit pollutants to the atmosphere. Of the fossil fuels commonly used (coal, oil, natural gas), natural gas is the least polluting. Nonetheless, natural gas combustion still results in significant amounts of pollutants released to the atmosphere. Oxides of

nitrogen, NOx, and carbon monoxide, CO, are the principal gaseous pollutants released in the combustion of natural gas. The potential annual emissions, assuming the plants operate at 100% capacity, from the Intergen La Rosita Power Complex under construction near Mexicali have been estimated to be 1,907 tons of NOx, 2,100 tons of CO and 857 tones of particulate matter (PM10). For the Sempra plant, the potential annual emissions would be 187 tons of NOx, 181 tons of CO and 237 tons of PM10. Due to market and operating constraints, the actual emissions from these two plants will be around 70% of these values. The actual emissions would represent an increase of 11 percent of the NOx emissions inventory for Mexicali and an increase of 7 percent for the binational air basin. A 1 percent increase in the emission inventory for CO is expected for the air basin as well.[1]

The challenge presented by new energy facilities is how to balance the inevitable increase in air pollution with viable alternatives. From a purely Mexican perspective, these new power plants are by far the cleanest in Mexico and use efficient combined cycle technology fired by natural gas. They also represent sizeable investment in the Mexicali region and provide for power needs of that growing area. Alternative sources of energy would have to be either coal, oil or expansion of the geothermal fields at Cerro Prieto. Coal or oil generated power would be far more polluting than natural gas and the economically recoverable heat from Cerro Prieto is nearly exhausted.

Although power plants located in Mexico will likely have a deleterious effect on air quality in Imperial County and Mexicali, residents in Imperial County have had no input with respect to design, siting or environmental assessment of these plants. The same is true for power plants based on the California side of the border, from the view of residents in Baja California. How to resolve the inherent tension between energy production and cross border pollutant transport in an equitable and agreed upon manner is the central issue in maintaining a viable binational energy market and a high quality of life for all binational residents. These issues are addressed in the next section where a series of recommendations are presented to meet these challenges.

Water issues

Large power plants use either water or air for cooling. For plants located on the coast, water cooling is used and the environmental impact of concern is thermal heating of the near shore marine environment and its effect on marine life. Since there are no large new power plants proposed on the coast, this is not a concern at the current time. In the arid Mexicali region, however, where most of the new power plant construction is taking place, water use for cooling is an important issue. As currently designed, the two main power plant complexes near Mexicali plan to use approximately 8.5 million gallons per day (MM gpd) of water derived from Mexicali's

[1] EPA, *The Border Report Special Energy Edition II*, Winter 2001, Issue no. 6

wastewater treatment system. The full significance to Mexicali of utilizing these large quantities of wastewater for power plant cooling purposes have not been fully examined, nor have cross border effects been studied sufficiently.

Alternative proposals for air cooling have been proposed instead of the use of wastewater. There are advantages and disadvantages to dry cooling compared wet cooling. Briefly, wet cooling results in greater power plant efficiency than dry cooling, but obviously requires large amounts of water. Air cooling requires large cooling structures, is more expensive to build, is less efficient, especially on hot days when power demand is high, but has a lower impact on scarce water resources. A typical 500 MW wet-cooled power plant consumes 2 MM gpd whereas a dry-cooled plant consumes 10% of that amount. A comprehensive analysis of the pros and cons of air vs. water cooling is needed for plants sited in water scarce regions.

IV Recommendations

The main recommendation growing out of the analysis presented here is to establish some type of *binational* entity where energy related issues in the California-Baja California region can be discussed on a regular basis. Such an entity might be called the *Binational Energy Forum (BEF)*, and the Borders Committee of SANDAG would be a logical entity to convene such a binational effort.

The Binational Energy Forum would be a place where key stakeholders from both sides of the border would meet and discuss energy related issues of importance to the region. Over time, such an entity could evolve into a binational institution with legal and regulatory authority recognized by both countries. There are precedents for such transborder institutions along the U.S-Mexican border, such as the International Boundary and Water Commission (IBWC) and the Joint Advisory Committee for Air Quality Improvement in the Paso del Norte Air Basin. Along the U.S.-Canadian border, the Joint Advisory Committee (JAC) has legal standing in both countries and is a major player in transborder water related issues.

Some possible topics for the Binational Energy Forum to consider are:

- How can local governments assist in the creation of new industries and services that will be needed in the emerging binational energy markets?
- Can and should local governments develop cross border land use plans?
- Can local governments on both sides of the border join forces to gain more clout with their state and federal authorities?
- Existing entities such as the Border Governors Association, the Border XXI process, Border Liaison Mechanisms, Good Neighbor Boards, California-Mexico Trade offices,

San Diego Office of Binational Affairs, SANDAG through its Borders Committee and COBRO and others should be encouraged to include energy related items in their agendas.

- How can "binational rules of the road" be promulgated so that project developers know what is required of them as they plan energy projects on the border region?
- Should a "Transboundary Environmental Impact Assessment" be used to assess cross border impacts of energy related projects?
- Would a common air basin straddling the border help in devising regulations to improve air quality on both sides of the border?
- What are the legal, regulatory and scientific aspects of creating a binational air shed?
- Are cross border air pollution trading permits feasible in the border region? What about transborder air pollution offsets?
- Should a binational permitting process be developed? How would such a process be organized? How would monitoring be enforced?
- How will security of energy supplies be guaranteed in a binational energy market?
- How should energy efficiency be encouraged so maximum savings can be achieved on both sides of the border?
- How can renewable energy technologies be developed in the border region?

The above suggestions are just a sample of many issues that could be addressed in the Binational Energy Forum. The important point is that structured and regular discussions need to begin with participants from both sides of the border.

The makeup of such a binational entity should include representatives from the major energy and environmental governmental agencies in the U.S., Mexico, California and Baja California. Local government participation is very important, since many energy issues involve land use authority and water rights. In addition to appropriate government agencies, the Forum should include representatives from the private sector, NGOs, Tribes, education and research institutions, and members of the public. Although such an arrangement appears unwieldy, it has proven to be the most effective way to generate consensus, although not always agreement, across a broad spectrum of interests. To make matters even more complex, any consensus must also be binational in nature.

But the history of successful relations in the border region has always required communicating across language and cultural divides, as well as political boundaries. It is a proven method and the sooner it begins, the sooner will all residents of the binational region benefit.

V. Conclusion

A new phenomenon has arisen in the California-Baja California binational region, that of a growing and integrated energy market with suppliers and producers located on both sides of the border. This market has presented the region with exciting opportunities for economic development and increased energy supplies. At the same time, new challenges must be met to provide environmental protection within an uncharted regulatory framework spanning the region between two sovereign nations.

To achieve the vision set forth earlier, i.e., that the quality of life for residents in the California-Baja California binational region will be greatly improved by the development of safe, reliable, affordable and clean sources of energy, only a truly *binational* approach is likely to succeed.